NOVEMBER/DECEMBER 2023

GOPH25A/DOPH25A — SPECTROSCOPY AND LASERS

Time : Three hours Maximum : 75 marks

SECTION A — (10 × 2 = 20 marks)

Answer ALL questions.

1. Which type of molecules are microwave active? Give examples.

2. Distinguish between symmetric and asymmetric top molecules.

3. What is the principle of IR spectroscopy?

4. What do you understand by normal modes of vibrations?

5. Is Raman scattering a coherent scattering? Give reasons for your answer.

6. List the advantages of Laser Raman spectroscopy.

7. Write any four characteristics of Lasers.

8. What do you meant by population inversion in lasers?

9. What is optical pumping?

10. Write any two medical applications of lasers.

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SECTION B — (5 × 5 = 25 marks)

Answer ALL questions.

11. (a) Discuss the rotational spectra of polyatomic molecules.

Or

(b) Discuss the interaction of radiation with rotating molecule.

12. (a) Explain why IR spectrum is not obtained for homo nuclear diatomic molecules.

Or

(b) Discuss the applications of FTIR spectroscopy.

13. (a) Explain classical theory of the Raman effect.

Or

(b) Compare the rotational Raman spectra and vibrational Raman spectra.

14. (a) Obtain Einstein's A and B coefficients.

Or

(b) Explain the role of optical resonators in lasers.

15. (a) With suitable energy level diagram explain the working of Nd-YAG laser.

Or

(b) Compare solid state lasers and gas lasers.

SECTION C — (3 × 10 = 30 marks)

Answer any THREE questions.

16. Explain the working of a microwave spectrometer with a block diagram.

17. Describe the normal modes of vibrations of CO_2 and H_2O molecules.

18. Explain how are IR and Raman spectroscopy used to determine the structure of the molecules.

19. Discuss various methods to achieve population inversion in laser.

20. Describe the construction of He-Ne laser and explain its operation with suitable energy level diagram.

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